

Fisher Controls

Instruction Manual

**Type 657 Diaphragm Actuator
Sizes 30-70 and 87****FISHER®**

September 1980

Form 1900

INTRODUCTION**Scope of Manual**

This instruction manual provides information on installation, adjustment, maintenance, and parts ordering for the Type 657 actuator in sizes 30 through 70 and size 87 and for the Type 657-4 actuator in sizes 70 and 87. Information for other equipment used with these actuators is found in separate manuals.

Description

The Type 657 actuator (figure 1) and the Type 657-4 actuator are direct-acting, spring-opposed diaphragm actuators used for automatic operation of control valves. The Type 657 actuator provides up to 3 inches (76 mm) maximum actuator travel while the Type 657-4 actuator provides 4 inches (102 mm) maximum actuator travel. Both actuators position the valve plug in response to varying pneumatic loading pressure on the diaphragm. Figure 2 schematically shows the operation of these actuators. Additionally, a Type 657 or 657-4 actuator can be furnished with either a top-mounted or side-mounted handwheel assembly. A top-mounted handwheel assembly is usually used as an adjustable up travel stop. A side-mounted handwheel assembly is usually used as an auxiliary manual actuator.

Specifications

Specifications for the Type 657 and 657-4 actuators are shown in table 1. Information for a specific actuator is also found on the nameplate (figure 3) of that actuator.



Figure 1. Type 657 Actuator Mounted on easy-e® Valve Body

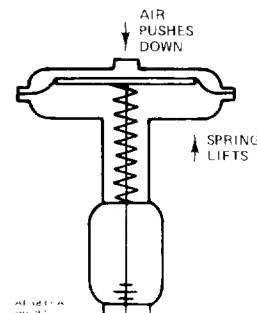


Figure 2. Schematic of Type 657 and 657-4 Actuators

Type 657

Table 1. Specifications

ACTUATOR SIZES	See table 2	MATERIAL TEMPERATURE CAPABILITIES	-40° to 180°F (-40° to 82°C)																																		
YOKE BOSS DIAMETERS	See table 2	PRESSURE CONNECTIONS	1/4 in. NPT female																																		
MAXIMUM ACTUATOR TRAVEL	See table 2	APPROXIMATE WEIGHTS	<table><tr><th rowspan="2">SIZE</th><th colspan="2">WEIGHT</th></tr><tr><th>Lb</th><th>kg</th></tr><tr><td>30</td><td>45</td><td>20</td></tr><tr><td>34</td><td>62</td><td>28</td></tr><tr><td>40</td><td>64</td><td>29</td></tr><tr><td>45</td><td>144</td><td>65</td></tr><tr><td>46</td><td>149</td><td>68</td></tr><tr><td>50</td><td>154</td><td>70</td></tr><tr><td>60</td><td>150</td><td>68</td></tr><tr><td>70</td><td>331</td><td>150</td></tr><tr><td>87</td><td>385</td><td>175</td></tr></table>			SIZE	WEIGHT		Lb	kg	30	45	20	34	62	28	40	64	29	45	144	65	46	149	68	50	154	70	60	150	68	70	331	150	87	385	175
SIZE	WEIGHT																																				
	Lb	kg																																			
30	45	20																																			
34	62	28																																			
40	64	29																																			
45	144	65																																			
46	149	68																																			
50	154	70																																			
60	150	68																																			
70	331	150																																			
87	385	175																																			
MAXIMUM ALLOWABLE OUTPUT THRUST	See table 2																																				
MAXIMUM DIAPHRAGM CASING PRESSURE	See table 2																																				

Table 2. Additional Specifications

SPECIFICATION		ACTUATOR SIZE								
		30	34	40	45	46	50	60	70*	87*
Nominal Effective Area	In. ²	46	69	69	105	156	105	156	220	220
	cm ²	297	445	445	677	1006	677	1006	1419	1419
Yoke Boss Diameters	In.	2-1/8	2-1/8	2-13/16	2-13/16	2-13/16	3-9/16	3-9/16	3-9/16	5
	mm	54	54	71	71	71	90	90	90	127
Acceptable Valve Stem Diameters	In.	3/8	3/8	1/2	1/2	1/2	3/4	3/4	3/4	1
	mm	9.5	9.5	12.7	12.7	12.7	19.1	19.1	19.1	25.4
Maximum Allowable Output Thrust	Lb.	2300	2300	2700	5650	7550	5650	6800	8800	8800
	N	10,230	10,230	12,010	25,131	33,582	25,131	30,246	39,142	39,142
Maximum Travel	In.	3/4	3/4	1-1/2	2	2	2	2	3†	3†
	mm	19	19	38	51	51	51	51	76†	76†
Maximum Diaphragm Casing Pressure‡	Psig	125	65	65	50	40	50	40	55	55
	Bar	8.6	4.5	4.5	3.4	2.8	3.4	2.8	3.8	3.8

*These values also apply to the Type 657-4 actuator construction
† Maximum travel for Type 657-4 actuator is 4 inches (102 mm).
‡ Maximum diaphragm casing pressure must not be exceeded and must not produce a force on the actuator stem greater than the maximum allowable actuator output thrust or the maximum allowable valve stem load.

FISHER CONTROLS CO. MARSHALLTOWN IOWA USA

SERIAL TYPE SIZE

TO PSI DIAPH PRES PORT

WITH PSI DROP BENCH SET TO PSI

BODY SIZE RATING TRAVEL

BODY FLOW

MATL CHAR

PLUG GUIDES

MATL

ORDER

MADE IN USA


☐ TAG 

Figure 3. Type 657 Actuator Nameplate

INSTALLATION

When an actuator and valve body are shipped together, the actuator is normally mounted on the valve. Follow the valve body instructions when installing the control valve in the pipeline. If the actuator is shipped separately or if it is necessary to mount the actuator on the valve, perform the "Actuator Mounting" procedures. Refer to figure 4.

Actuator Mounting

1. Screw the stem locknuts all the way onto the valve stem. Put the travel indicator disc, not used with the size 87 actuator, on the locknuts. The concave side of the disc should face the valve.

Type 657**CAUTION**

Do not clamp just the tip of either the valve stem or the actuator stem in the stem connector. Incomplete engagement of both valve stem and actuator stem in the stem connector may result in stripped threads or improper operation. Be sure that the length of each stem clamped in the stem connector is equal to or greater than the diameter of that stem.

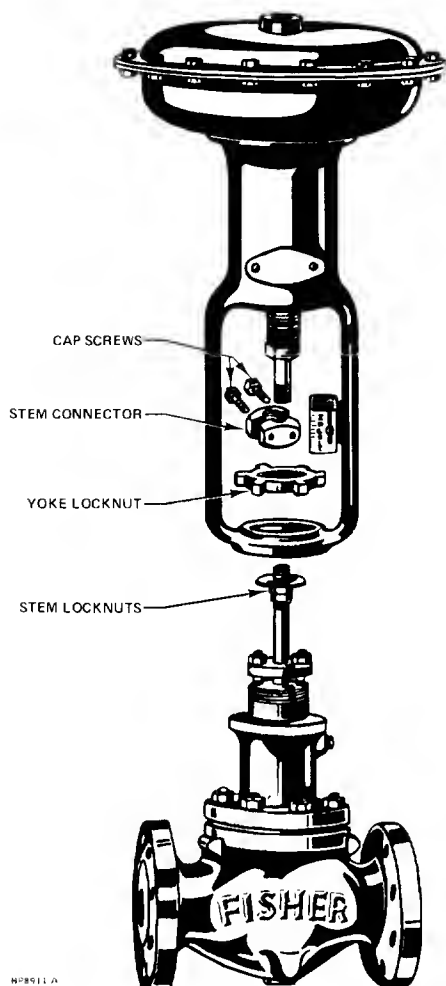


Figure 4. Actuator Mounting Components for Sizes 30 through 70 Actuators

2. For **direct-acting valves**, push the valve stem down to close the valve.

For **reverse-acting valves**, push the valve stem down to open the valve.

3. Place the actuator on the valve bonnet. For size 30 through 70 actuators, lift or hoist the actuator, if necessary, in order to slip the yoke locknut over the valve stem.

4. For **size 87 actuator**, insert the cap screws, and tighten the hex nuts, securing the actuator to the bonnet.

For **all other sizes**, screw the yoke locknut tightly onto the bonnet, securing the actuator to the bonnet.

5. Turn the spring adjustor (key 12, figures 5, 6, and 7) into the yoke several turns forcing the actuator stem to the top of its travel.

6. Clamp the actuator and valve body stems between the two stem connector halves. Insert and tighten the two stem connector cap screws.

7. Raise the travel indicator disc to the stem connector, and thread the stem locknuts against the stem connector.

8. Align the travel indicator scale to show valve position.

Loading Connection

1. Connect the loading pressure piping to the 1/4-inch connection in the top of the diaphragm casing.

2. For size 70 and 87 actuators, remove the 1/4-inch bushing in the 1/2-inch connection to increase connection size, if necessary. Either piping or tubing may be used.

3. Keep the length of tubing or piping as short as possible to avoid transmission lag in the control signal. If an accessory (such as a volume booster or valve positioner) is used, be sure that the accessory is properly connected to the actuator.

4. Cycle the actuator several times to check that the valve stem travel is correct and that the travel occurs when the correct pressure range is applied to the diaphragm.

5. If valve stem travel is incorrect, refer to the "Travel" procedure in the "Adjustments" section.

6. If the pressure range is incorrect, refer to the "Spring" procedure in the "Adjustments" section.

ADJUSTMENTS

Travel

Make travel adjustments when the motion observed during actuator travel is different from the travel stamped on the actuator nameplate (figure 3).

When adjusting travel of a reverse-acting valve, slightly pressure the actuator. This moves the valve plug off of the seat, reducing the chance of damaging the valve plug or seat during adjustments.

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1. Back the stem locknuts and indicator disc away from the stem connector, and slightly loosen the stem connector cap screws.

CAUTION

Do not use wrenches or other tools directly on the valve stem, or damage to the stem surface and subsequent damage to the valve packing may result.

2. Tighten the locknuts together, use a wrench on these locknuts, and screw the valve stem either into the stem connector to lengthen travel or out of the stem connector to shorten travel.

3. Cycle the actuator to check for the specified travel. If travel is not equal to the specified travel, adjust and check travel until correct. Tighten the stem connector cap screws when correct travel is obtained.

4. Raise the travel indicator disc by threading the stem locknuts against the stem connector.

Spring

Make spring adjustments when the loading pressure range applied to achieve specified travel is not equal to the pressure range stamped on the actuator nameplate (figure 3). Refer to the "Bench Set" pressure range on the nameplate when the valve contains no pressure and the packing is loosely inserted in the bonnet. Refer to the "Diaphragm Pressure" range on the nameplate when the valve is controlling the specified pressure drop and the packing is tightened to stop leaks around the stem.

1. Monitor loading pressure carefully when making adjustments. Do not exceed the pressure specifications of either the loading regulator or the actuator casings.

2. Each actuator spring has a fixed pressure span. Changing the spring compression shifts the span up or down to make valve travel coincide with the loading pressure range.

3. Turn the spring adjustor (key 12, figures 5, 6, and 7) into the yoke (key 9, figures 5, 6, and 7) to shift the span up or turn the spring adjustor out of the yoke to shift the span down.

If the actuator has a side-mounted handwheel assembly (manual operator), clockwise handwheel rotation closes the valve.

For successful operation, the actuator stem and valve plug stem must move freely in response to the loading pressure change on the diaphragm.

MAINTENANCE

Actuator parts are subject to normal wear and must be inspected and replaced when necessary. The frequency of inspection and replacement depends on the severity of service conditions.

WARNING

Avoid personal injury or damage to property from sudden release of pressure or uncontrolled process fluid. Before starting to disassemble:

- Isolate the valve from the process.
- Release process pressure.
- Vent the actuator loading pressure, and
- Relieve all spring compression.

The maintenance instructions are divided into four sections: "Actuator," "Top-Mounted Handwheel Assembly (Adjustable Up Travel Stop)," "Side-Mounted Handwheel Assembly (Manual Operator) for Size 34 through 60 Actuators," and "Side-Mounted Handwheel Assembly (Manual Operator) for Size 70 and 87 Actuators."

Actuator

This procedure describes how the actuator can be completely disassembled and assembled. When inspection or repairs are required, disassemble only those parts necessary to accomplish the job; then, start the assembly at the appropriate step.

Key numbers refer to figures 5, 6, or 7. Figure 5 illustrates the size 30 through 60 actuators, figure 6 shows the size 70 actuator, and figure 7 depicts the size 87 actuator.

Disassembly

1. Bypass the control valve. Reduce the loading pressure to atmospheric, and remove the tubing or piping from the top of the diaphragm casing (key 1).

2. Thread the spring adjustor (key 12) out of the yoke (key 9) until all spring compression is relieved.

3. If necessary, remove the actuator from the valve body by separating the stem connector (key 26) and removing the yoke locknut or, for the size 87 actuator, the stud bolt nuts. Separate the stem connector by loosening the stem locknuts (keys 15 and 16) and unscrewing the two cap screws.

4. Remove diaphragm casing cap screws and nuts (keys 22 and 23), and lift off the upper diaphragm casing (key 1).

5. Take out the molded diaphragm (key 2).
6. Remove the diaphragm plate and actuator stem (keys 4 and 10) as an assembly. This assembly can be broken down further, if desired, by removing the cap screw (key 3).
7. Take out the actuator spring (key 6) and the spring seat (key 11).
8. The lower half of the diaphragm casing (key 5) can be removed from the yoke, if required, by loosening the cap screws (key 8) that hold it in place.
9. Remove the spring adjustor (key 12), if required, by unscrewing it from the yoke.

Assembly

1. Coat the threads and the spring seat bearing surface of the spring adjustor (key 12) with Lubriplate MAG-1* or equivalent lubricant, and thread the spring adjustor into the yoke (key 9). Place the spring seat (key 11) in the yoke on the spring adjustor.
2. Position the lower diaphragm casing (key 5) on the yoke (key 9), and fasten the parts together by evenly tightening the cap screws (key 8).
3. Slide the spring (key 6) squarely onto the lower spring seat (key 11).
4. If the diaphragm plate and actuator stem (keys 4 and 10) are separate, fasten them together using the cap screw and washer (keys 3 and 25). Slide the diaphragm rod and diaphragm plate (keys 10 and 4) into the yoke so that the spring (key 6) fits squarely between the diaphragm plate and the spring seat (key 11). Also, the diaphragm rod (key 10) slides through the spring adjustor (key 12).
5. Place the diaphragm (key 2) pattern side up on the diaphragm plate (key 4). Align the holes in the diaphragm and the lower diaphragm casing (key 5).
6. Position the upper diaphragm casing (key 1) on the diaphragm (key 2) and align the holes.

CAUTION

Over-tightening the diaphragm casing cap screws and nuts (keys 22 and 23) can damage the diaphragm. Do not exceed 20 foot-pounds (27 newton meters) torque.

7. Insert the cap screws (key 22), and tighten the hex nuts (key 23) to 20 ft-lb (27 N•m) torque following an even, crisscross pattern.

8. Mount the actuator on the valve in accordance with the procedures in the "Installation" section.

Top-Mounted Handwheel Assembly (Adjustable Up Travel Stop)

A top-mounted handwheel assembly is usually used as an adjustable up travel stop to limit full retraction of the actuator stem. Turning the handwheel clockwise turns the handwheel stem (key 133, figures 8 and 9) into the diaphragm casing and forces the pusher plate assembly (key 135, figures 8 and 9) against the diaphragm and diaphragm plate. Instructions are given below for complete disassembly and assembly. Perform the disassembly only as far as necessary to accomplish the required maintenance; then, begin the assembly at the appropriate step.

The key numbers in this section refer to both figures 8 and 9 unless otherwise specified.

Disassembly

1. Bypass the control valve. Reduce the loading pressure to atmospheric, and remove the tubing or piping from the diaphragm casing (key 1, figures 5, 6, or 7).
2. Turn the spring adjustor (key 12, figures 5, 6, or 7) counterclockwise to relieve all spring compression.
3. Remove the diaphragm casing cap screws (key 22, figures 5, 6, or 7), and lift off the upper diaphragm casing and handwheel assembly.
4. If necessary, the handwheel assembly can be separated from the diaphragm casing by removing the cap screws (key 141). This may be necessary to replace the O-ring (key 139) or for ease of handling.
5. Loosen the locknut (key 137), and turn the handwheel (key 51) clockwise. Remove hex nut (key 54) and washer (key 134), and lift off the handwheel.
6. Unscrew the locknut (key 137) from the handwheel stem (key 133), and turn the stem out of the bottom of the body (key 142). A screwdriver slot in the top of the stem is provided for this purpose.
7. Replace the O-ring (key 138) in the body (key 142).
8. For a handwheel assembly used on size 30 through 60 actuators, complete the disassembly by driving out the groove pin (key 140, figure 8) and sliding the pusher plate (key 135, figure 8) off the stem.

For a handwheel assembly used on a size 70 or 87 actuator, complete the disassembly by unscrewing the

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retaining screw (key 174, figure 9) and removing the thrust bearing and pusher plate (keys 175 and 135, figure 9).

Assembly

1. For a handwheel assembly used on size 30 through 60 actuators, coat the end of the stem (key 133, figure 8) with Lubriplate MAG-1 or equivalent lubricant. Slide the pusher plate (key 135, figure 8) onto the stem, and drive in the groove pin (key 140, figure 8) to lock the pieces together.

For a handwheel assembly used on a size 70 or 87 actuator, pack the thrust bearing (key 175, figure 9) with Lubriplate MAG-1 or equivalent lubricant. Place the thrust bearing in the pusher plate (key 135, figure 9), slide the two parts (keys 175 and 135, figure 9) onto the stem (key 133). Coat the retaining screw threads with Loctite* No. 242 or equivalent sealant. Insert and tighten the retaining screw (key 174, figure 9).

2. Coat the O-ring (key 138) with Lubriplate MAG-1 or equivalent lubricant, and insert the O-ring in the body (key 142).

3. Coat the threads of the stem (key 133) with Lubriplate MAG-1 or equivalent lubricant. Screw the stem into the body (key 142).

4. Thread the locknut (key 137) onto the stem (key 133).

5. Place the handwheel (key 51), the washer (key 134), and hex nut (key 54) on the stem. Tighten the hex nut to fasten the parts together.

6. If the body (key 142) was separated from the diaphragm casing (key 1, figures 5, 6, and 7), lubricate the O-ring (key 139) with Lubriplate MAG-1 or equivalent lubricant, place the O-ring in the body, align the holes in the diaphragm casing and the body, insert the cap screws (key 141), and tighten them evenly following a crisscross pattern to ensure a proper seal.

7. Complete steps 6 through 8 in the "Assembly" portion of the "Actuator" maintenance section.

Side-Mounted Handwheel Assembly (Manual Operator) for Size 34 through 60 Actuators

A side-mounted handwheel assembly (figure 10) is usually used as a manual operator. Turning the handwheel clockwise past the neutral position always opens the valve. A lever (key 146, figure 10) on a handwheel assembly opens the valve by moving the valve stem.

Instructions are given below for complete disassembly and assembly. Perform the disassembly only as far as necessary

to accomplish the required maintenance; then, begin the assembly at the appropriate step.

Key numbers refer to figure 10.

Disassembly

1. If desired, the handwheel assembly can be removed from the actuator yoke. To do this, remove the nuts (keys 147 and 170) from the U-bolts (keys 166 and 143) that hold the assembly to the yoke.

2. Remove retaining ring (key 154), and drive out lever pilot pin (key 153).

3. There are two screws (key 156) that hold the right and left hand levers (key 146) together. Remove the screw from the top of the levers so that the levers will drop down out of the assembly. Disassemble further, if necessary, by removing the other screw.

4. Remove screw (key 161) and pointer mounting bolt (key 159, not shown) located behind pointer (key 160).

5. Remove nut (key 54), lockwasher (key 150), and washer (key 149), and take off the handwheel (key 51). Be careful not to lose the small ball (key 55) and spring (key 56).

6. Using a suitable tool, unscrew the bearing retainer (key 136) after loosening the locking set screw (key 168, not shown).

7. Pull the handwheel screw (key 145) out of the handwheel body. The operating nut (key 132) will come out with the screw but the bearing (key 152) may not. On a handwheel assembly for size 34 or 40 actuator, the bushing (key 151) should come out with the screw also.

8. If required, remove the bearings (key 152), one from the bearing retainer and the other from the handwheel body.

Assembly

1. Pack the bearings (key 152) with Lubriplate MAG-1 or equivalent lubricant. Insert one bearing and the bushing (key 151) in the handwheel body (key 142) as shown in figure 10.

2. Coat the threads of the handwheel screw (key 145) with Lubriplate MAG-1 or equivalent lubricant, and thread the operating nut (key 132) onto the screw. Slide the second bearing (key 152) onto the screw, and insert the end of the handwheel screw into the bushing (key 151) as shown in figure 10.

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3. Thread the bearing retainer (key 136) into the body (key 142), using a suitable tool. Completely tighten the retainer, and then loosen it one-quarter turn. Tighten the set screw (key 168, not shown) to hold the bearing retainer in place.

4. Coat the groove in the handwheel body (key 142) with Lubriplate MAG-1 or equivalent lubricant. Insert the spring (key 56) and ball (key 55) into the handwheel (key 51). Holding the ball and spring in the handwheel, put the handwheel (key 51), the washer (key 149), the lockwasher (key 150), and the hex nut (key 54) on the end of the screw (key 145). Tighten the hex nut.

5. Position the pointer mounting bolt (key 159, not shown) and pointer (key 160) as shown in figure 10. Insert and tighten the screw (key 161).

6. Assemble the two levers (key 146) with the cap screws (key 156) for handwheel assemblies for size 45, 50, and 60 actuators or with the machine bolts (key 156) for handwheel assemblies for size 34 and 40 actuators.

7. If the handwheel assembly was removed from the yoke, position the U-bolts (keys 166 and 143) on the yoke, and tighten the nuts (keys 170 and 147) to hold the handwheel assembly in position.

8. Position the levers (key 146) as shown in figure 10. Insert the lever pilot pin (key 153), and snap the retaining ring (key 154) onto the lever pilot pin.

Side-Mounted Handwheel Assembly (Manual Operator) for Size 70 and 87 Actuators

A side-mounted handwheel assembly (figure 11) is usually used as a manual operator. Turning the hand clockwise past the neutral position always opens the valve. A pair of sleeves (keys 34 and 46, figure 11) opens the valve by moving the valve stem.

Instructions are given below for complete disassembly and assembly. Perform the disassembly only as far as necessary to accomplish the required maintenance; then, begin the assembly at the appropriate step.

Key numbers refer to figure 11.

Disassembly

1. Bypass the control valve. Reduce diaphragm loading pressure to atmospheric. Disconnect the loading pressure tubing or piping at the diaphragm casing.

2. Remove the cover band (key 60), and relieve spring compression by turning the spring adjuster (key 12) counterclockwise.

3. Remove the cap screws and nuts (keys 22 and 23). Lift off the diaphragm casing assembly (key 1), and remove the diaphragm (key 2).

4. Remove the socket head cap screw (key 3) and the washer (key 25), and take off the diaphragm plate (key 4).

5. Take the spring (key 6), the upper sleeve (key 34), and the spring seat (key 11) out of the yoke. This exposes the needle bearing and races (keys 37 and 38).

6. Separate the halves of the stem connector assembly (key 26) by removing the two cap screws. Take out the actuator stem (key 10).

7. Remove the travel stop indicator (key 58) and screws (key 28) from the lower sleeve (key 46).

8. Turn the handwheel to raise the lower sleeve (key 46). Continue turning the handwheel until the lower sleeve is free of the worm gear (key 44). Lift out the lower sleeve and the key (key 47).

9. Loosen two set screws (key 40), and unscrew the bearing retainer flange (key 39) and the attached spring adjuster (key 12), using a suitable tool in the open neck of the flange. Take out the worm gear and the two needle bearings (key 42), one on each side of the worm gear.

10. Remove the spring adjuster (key 12) from the bearing retainer flange (key 39).

11. The worm shaft (key 45) and associated parts can be removed in order to replace or lubricate them. First, remove the handwheel nut (key 54) and the handwheel (key 51). Don't lose the small ball (key 55) and spring (key 56).

12. Loosen the two set screws (key 41), and unscrew the two worm retainers (keys 48 and 49). The ball bearings (key 50) will come out with the retainers. Remove the worm shaft (key 45).

Assembly

1. The front and back worm retainers (keys 48 and 49) each have a slot in their threads for a set screw (key 41). Pack the ball bearings (key 50) with Lubriplate MAG-1 or equivalent lubricant, and insert one ball bearing in the back worm retainer (key 49) as shown in figure 11.

2. Thread the back worm retainer and ball bearing (keys 49 and 50) into the yoke. Align the slot in the worm retainer with the set screw hole in the yoke, insert the set screw (key 41), and tighten it.

3. Coat the worm shaft (key 45) threads with Lubriplate MAG-1 or equivalent lubricant, and slide the shaft into the yoke so that the end of the shaft fits snugly in the back worm retainer.

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Key	Description	Part Number
8	Cap Screw, pl steel (Continued) Push Down to Open Valve Size 30 (3 req'd)	1D5298 24052
	Sizes 34 & 40 (3 req'd)	1A3684 24052
	Sizes 45, 46, 50 & 60 (4 req'd)	1A3684 24052
	Sizes 70 & 87 (9 req'd)	1N1293 28992
9	Yoke	
	Size 30	
	Cast iron	3E7926 19042
	Steel	3K8301 22012
	Size 34	
	Cast iron	2E8696 19042
	Steel	2H7865 22012
	Size 40	
	Cast iron	3E8070 19042
	Steel	3H7867 22012
	Sizes 45 & 46	
	Cast iron	2E9037 19042
	Steel	2H7869 22012
	Sizes 50 & 60	
	Cast iron	3E8323 19042
	Steel	3K8302 22012
	Size 70	
	Cast iron	3N1273 19042
	Steel	3N1276 22012
	Cast iron (for side mtd handwheel)	4N8901 19042
	Size 87	
	Cast iron	3N6639 19042
	Steel	3N7584 22012
	Cast iron (for side mtd handwheel)	4N8866 19042

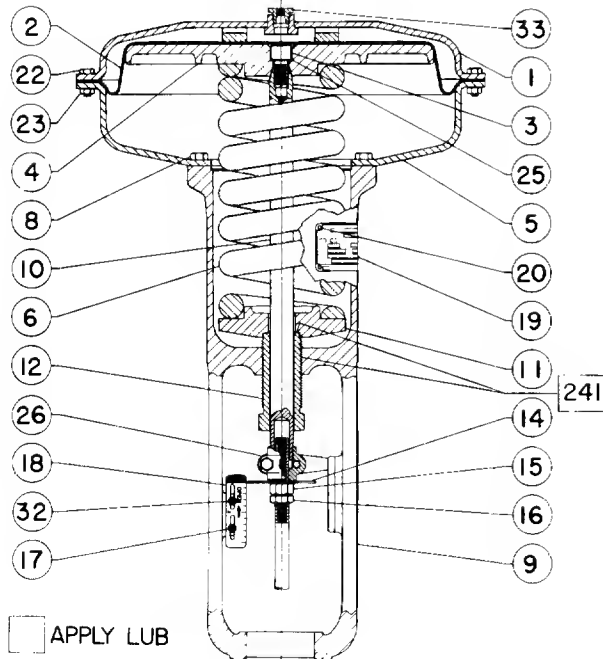


Figure 6. Type 657 Size 70 Actuator

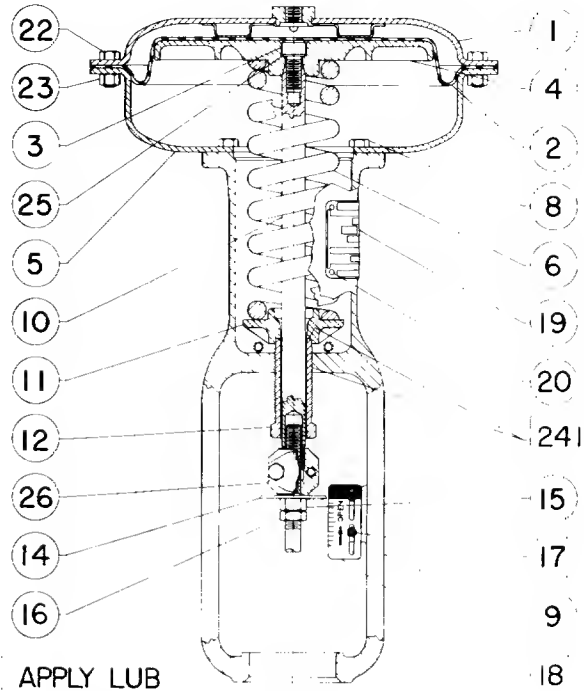


Figure 5. Type 657 Actuator Sizes 30 Through 60

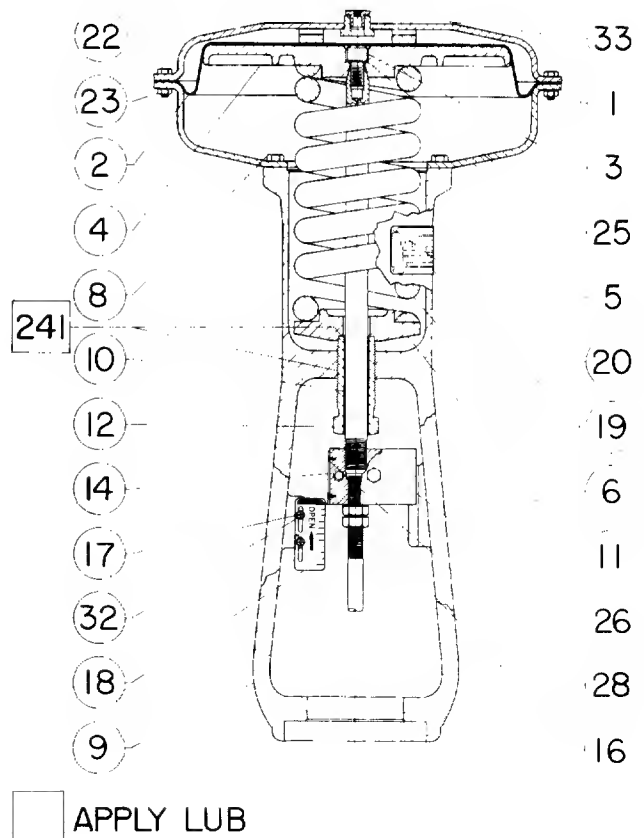


Figure 7. Type 657 Size 87 Actuator

Type 657

Key	Description	Part Number	Key	Description	Part Number	Key	Description	Part Number
10	Actuator Stem, Cd pl steel Type 657 Size 30 Size 34 Size 40 Sizes 34 & 40 (for side mtd handwheel) Sizes 45 & 46 Sizes 50 & 60 Size 70 Thru 2" (51 mm) travel Over 2" (51 mm) travel For side mtd handwheel Thru 2" (51 mm) travel Over 2" (51 mm) travel Size 87 Size 87 (for side mtd (handwheel) Type 657-4 Size 70 Size 70 (for side mtd handwheel) Size 87 (for side mtd handwheel)	1E7927 24102 1E8729 24102 1E8071 24102 1F3258 24102 1J3329 24102 1E8324 24102 1N1294 24102 1N1325 24102 1N8905 24102 1N8904 24102 1N6640 24102 1N8889 24102 1V9656 X00A2 11A9914 X012 10A2444 X012	14	Travel Indicator, SST Sizes 30 & 34 Sizes 40, 45 & 46 Sizes 45 & 46 (for side mtd handwheel) Sizes 50, 60 & 70 Size 70 (for side mtd handwheel) Size 87 Size 87 (for side mtd handwheel) Hex Nut, pl steel Sizes 30 & 34 (2 req'd) Size 40 Sizes 50, 60 & 70 Hex Jam Nut, pl steel Size 40 Sizes 45 & 46 (2 req'd) Sizes 50, 60 & 70 Size 87 (2 req'd) Self-Tapping Screw, steel (2 req'd) Sizes 30, 34, 40, 45 & 46 Sizes 45 & 46 (for side mtd handwheel) Sizes 50, 60, 70 & 87 Sizes 70 & 87 (for side mtd handwheel)	1E7931 38992 1E8075 38992 1L2045 36012 1E8328 38992 189718 38992 10A8487 X012 10A8487 X012 1P1312 24142 1A4132 24122 1A3754 24122 1A3537 24122 1A3537 24122 1A3511 24122 1C6352 24122 1E7932 38992 1B9925 28992 1E8313 38992 1A3406 28982	24	Twin Speed Nut, SST (not shown) Sizes 30 & 34 Sizes 40, 45 & 46 Sizes 50, 60, 70 & 87 Washer, pl steel Size 30 Sizes 45, 46, 50 60, 70 & 87 Stem Connector, SST Sizes 30 & 34 Size 34 w/side mounted handwheel Size 40 Size 40 w/side mounted handwheel Sizes 45 & 46 Sizes 45 & 46 w/side mounted handwheel Sizes 50 & 60 Sizes 50 & 60 w/side mounted handwheel Size 70 Size 70 w/side mounted handwheel Size 87 Size 87 w/side mounted handwheel	1E7939 38992 1E8084 38992 1E8335 38992 1E7941 28992 1E8336 28992 1E7977 000A2 1F6592 25142 1E8033 000A2 1F6591 25142 1J3330 000A2 2F1678 000A2 1E8337 000A2 2F1672 000A2 1H8655 000A2 1N8903 000A2 21A7469 X012 21A7470 X012
11	Spring Seat Size 30, steel Sizes 34 & 40, steel Sizes 45, 46, 50, 60, steel Sizes 70 & 87 Cast iron Steel Cast iron (for side mtd handwheel)	1U4256 23122 1R1799 23122 1R1800 23122 1N1296 19052 1N7577 22012 1N8871 19042	18	Travel Indicator Scale	see following table	28	Machine Screw, pl steel Sizes 45 & 46 (for side mtd handwheel) Size 87 (2 req'd)	1A7691 28992 1H7365 28992
12	Spring Adjustor, steel Type 657 Size 30 Sizes 34 & 40 Sizes 34 & 40 (for side mtd handwheel) Sizes 45, 46, 50 & 60 Sizes 70 & 87 Sizes 70 & 87 (for side mtd handwheel) Type 657-4 Size 70 Sizes 70 & 87 (for side mtd handwheel)	1E7929 24102 1E8073 24102 1F1368 24102 1E8326 24102 1N1297 24102 1N8869 24392 1N1297 24102 1V1766 24092	19	Nameplate, SST	1K3257 38992	29	Yoke Extension, cast iron Type 657-4 only	3R6758 19042
			20	Drive Screw, SST (4 req'd)	1A3682 28982	30	Indicator Adaptor, brass Sizes 45 & 46 (for side mtd handwheel) (2 req'd)	1F5482 14012
			22	Cap Screw, pl steel Size 30 (12 req'd) Sizes 34 & 40 (16 req'd) Sizes 45 & 50 (20 req'd) Sizes 46 & 60 (24 req'd) Sizes 70 & 87 (28 req'd)	1E7603 24052 1E7603 24052 1A6751 24052 1A6751 24052 1A5828 24052	31	Machine Screw, pl steel Sizes 45 & 46 (for side mtd handwheel) (2 req'd)	1A3319 28982
			23	Hex Nut, pl steel Size 30 (12 req'd) Sizes 34 & 40 (16 req'd) Sizes 45 & 50 (20 req'd) Sizes 46 & 60 (24 req'd) Sizes 70 & 87 (28 req'd)	1A3465 24122 1A3465 24122 1A3465 24122 1A3465 24122 1A3465 24122	32	Washer Sizes 70 & 87, steel (2 req'd) For side mtd handwheel, brass	1E8730 28992 1F5656 18992
						33	Pipe Bushing, pl steel Sizes 70 & 87	1C3790 26232
						73	Cap Screw, pl steel (12 req'd) Type 657-4 only	1A7711 32982
						238	Warning Tag, 304 SST Type 657-4 Size 70	11A6440 X012
						241	Lubriplate MAG-1, 14 oz (0.396 kg) can (not furnished with the actuator)	1M1100 X0012

Type 657

Key 6 Actuator Spring

ACTUATOR SIZE	DIAPHRAGM PRESSURE RANGE		TRAVEL, IN. (mm)					
	Psig	Bar	7/16 (11)	5/8 (16)	3/4 (19)	1-1/8 (29)	1-1/2 (38)	2 (51)
30	3-15	0.2-1.0	1E7953 27082 Light Blue	1E7955 27092 Brown	1E7923 27092 Dark Gray	...	...	...
	6-30	0.4-2.0	1E7956 27082 White	1E7954 27082 Light Gray	1E7924 27082 Light Green	...	...	...
34† & 40	3-15	0.2-1.0	1E8051 27082 Aluminum	1E8049 27082 Yellow	1E8058 27082 Light Gray	1E8053 27092 Dark Gray	1E8056 27092 Dark Green	...
	6-30	0.4-2.0	1E8050 27082 Purple	1E8048 27082 Light Blue	1E8052 27082 Orange	1E8055 27082 Dark Blue	1E8058 27082 Light Gray	...
45 & 50	3-15	0.2-1.0	...	1E8267 27082 Tan	1E8262 27082 Light Green	1E8261 27082 Dark Gray	1E8266 27082 Orange	1E8269 27082 Dark Green
	6-30	0.4-2.0	...	1E8256 27082 Purple	1E8255 27082 Aluminum & Red	1E8264 27082 Light Gray	1E8262 27082 Light Green	1E8265 27082 Red
46 & 60	3-15	0.2-1.0	...	1E8258 27082 Yellow	1E8257 27082 Brown	1E8262 27082 Light Green	1E8265 27082 Red	1E8270 27082 Aluminum & Dark Blue
	6-30	0.4-2.0	...	...	1E8260 27082 Bronze	1E8255 27082 Aluminum & Red	1E8257 27082 Brown	1E8263 27082 Aluminum & Dark Green
			3/4 (19)	1-1/8 (29)	1-1/2 (38)	2 (51)	3 (76)	4 (102)
70 & 87	3-15	0.2-1.0	1N1279 27082 Red	1N7193 27082 White	1N1287 27082 Yellow	1N1284 27082 Light Green	1N1286 27082 Dark Gray	...
	6-30	0.4-2.0	...	1N1281 27082 Brown	1N1279 27082 Red	1N1285 27082 Light Blue	1N1287 27082 Yellow	1R6760 27082‡ Black

† 1-1/8" (29 mm) and 1-1/2" (38 mm) travels available in size 40 only.
‡ Diaphragm pressure range for this spring & travel combination is 6-22 psig (0.4-1.5 bar).

Key 7 Travel Stop (Use With Push Down to Open Valve Plug Only)

ACTUATOR SIZE	TRAVEL, IN. (mm)					
	7/16 (11)	5/8 (16)	3/4 (19)	1-1/8 (29)	1-1/2 (38)	2 (51)
30 (3 req'd)	1F3932 24092	1E7979 24092	1E7925 24092	...	...	...
34 & 40 (3 req'd)	1E8064 24092	1E8065 24092	1E8066 24092	1E8067 24092	1E8068 24092	...
45 & 50 (4 req'd)	...	1E8273 24092	1E8318 24092	1E8319 24092	1E8064 24092	1E8321 24092
46 & 60 (4 req'd)	1H1952 24092	1E8273 24092	1E8318 24092	1E8319 24092	1E8064 24092	1E8321 24092
	3/4 (19)	1-1/8 (29)	1-1/2 (38)	2 (51)	3 (76)	
70 & 87 (3 req'd)	1N1288 24092	1N1289 24092	1N1290 24092	1N1291 24092	1N1292 24092	

Key 18 Travel Indicator Scale

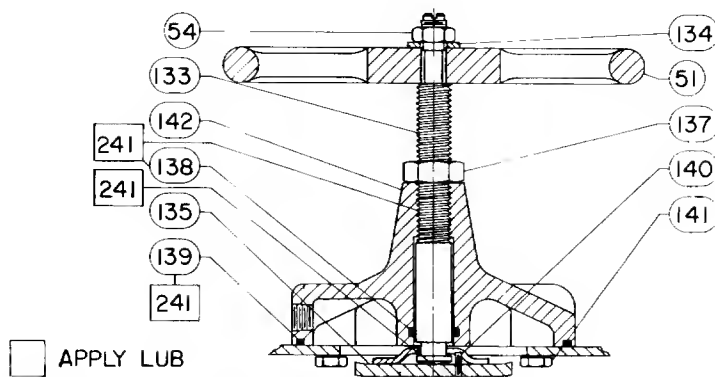
ACTUATOR SIZE	TRAVEL, IN. (mm)					
	7/16 (11)	5/8 (16)	3/4 (19)	1-1/8 (29)	1-1/2 (38)	2 (51)
30 & 34	1E7934 38992	1E7935 38992	1E7936 38992	...	...	...
40, 45, 46	1E8076 38992	1E8077 38982	1E8081 38992	1E8082 28992	1E8083 38992	1R4445 38982
50, 60	...	1E8330 38982	1E8331 38992	1E8332 28992	1E8333 38992	1E8334 38992
	3/4 (19)	1-1/8 (29)	1-1/2 (38)	2 (51)	3 (76)	4 (102)
70	1E8331 38992	1E8332 38992	1E8333 38992	1E8334 38992	1N1298 38992	1U3727 38982
87 & 70MO	1H7457 38992	1H7458 38992	1H7459 38992	1H7460 38992	1H7461 38992	1J2452 38982

Type 657

Key Description Part Number

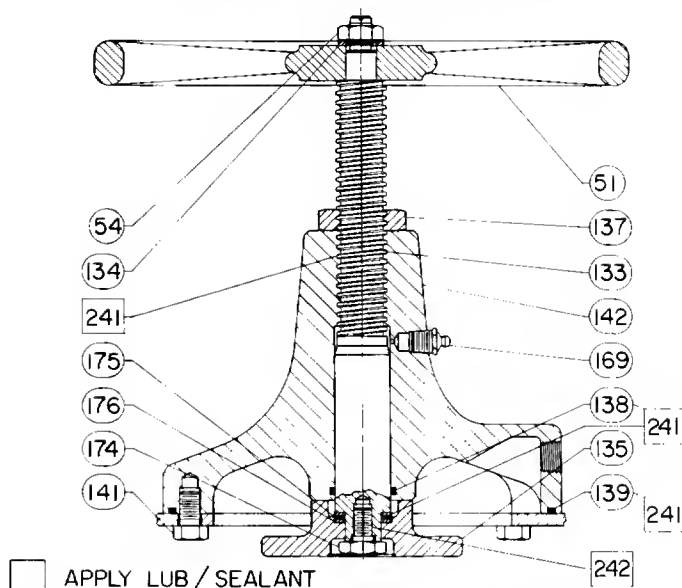
Top Mounted Handwheel

51	Handwheel	
	Size 30	
	Cast iron	1F1438 19042
	Steel	1H5518 22012
	Sizes 34 & 40	
	Cast iron	1F1181 19042
	Steel	1H5518 22012
	Sizes 45, 46, 50 & 60	
	Cast iron	1F1185 19042
	Steel	1H5520 22012
	Size 70 & 87	
	Cast iron	2A1937 19042
54	Nut, pl steel	
	Sizes 30, 34, 40, 45, 46, 50 & 60	1A3537 24122
	Sizes 70 & 87	1A3540 24122
133	Stem, brass	
	Size 30	1F1178 14042
	Sizes 34 & 40	1F1182 14042
	Sizes 45, 46, 50 & 60	1F1186 14042
	Sizes 70 & 87	
	Type 657	2R6795 14042
	Type 657-4	20A0635 X012
134	Washer, steel	
	Sizes 30 thru 60	1A5189 25072
	Sizes 70 & 87	1A3539 28992
135	Pusher Plate	
	Sizes 30, 34 & 40, steel	1F1179 99012
	Sizes 45, 46, 50 & 60, steel	1F1183 99012
	Sizes 70 & 87, Cast iron	1R6796 19022
137	Hex Nut, pl steel	
	Sizes 30, 34 & 40	1A3511 24122
	Sizes 45, 46, 50 & 60	1F1187 24122
	Sizes 70 & 87	1N8556 24502
138*	O-Ring, nitrile	
	Sizes 30, 34 & 40	1D2375 06992
	Sizes 45, 46, 50 & 60	188855 06992
	Sizes 70 & 87	1C4157 06992
139*	O-Ring, nitrile	
	Sizes 30, 34 & 40	1D2673 06992
	Sizes 45, 46, 50 & 60	1D5471 06992
	Sizes 70 & 87	1D2691 06992
140	Groove Pin	
	Sizes 30, 34 & 40, steel	1F1180 28992
	Sizes 45, 46, 50 & 60, SST	186270 35072
141	Cap Screw, pl steel	
	Sizes 30, 34 & 40 (6 req'd)	1A3684 24052
	Sizes 45, 46, 50 & 60 (8 req'd)	1A3684 24052
	Sizes 70 & 87 (12 req'd)	1N1293 28992



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Figure 8. Top Mounted Handwheel Assembly for Size 30 Through 60 Actuators



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Figure 9. Top Mounted Handwheel Assembly for Size 70 and 87 Actuators

Key	Description	Part Number	Key	Description	Part Number
142	Handwheel Body		142	Handwheel Body (Continued)	
	Size 30			Sizes 70 & 87, cast iron	
	1/4" Supply Connection			Type 657	2N8557 19022
	Cast iron	2K7229 19012		Type 657-4	2U9784 19022
	Steel	2L5947 22012	169	Grease Fitting	
	1/2" Supply Connection			Sizes 70 & 87	1L8478 28992
	Cast iron	2K7228 19012	174	Retaining Screw, steel	
	Sizes 34 & 40			Sizes 70 & 87	1R6797 24092
	1/4" Supply Connection		175	Thrust Bearing, steel	
	Cast iron	2K7227 19012		Sizes 70 & 87	1N8380 99012
	Steel	2K7224 22012	176	Thrust Race	
	1/2" Supply Connection			Sizes 70 & 87	
	Cast iron	2K7223 19012		(2 req'd)	1N8381 99012
	Sizes 45, 46, 50 & 60		241	Lubriplate MAG-1, 14 oz (0.396 kg) can (not furnished with handwheel)	1M1100 X0012
	1/4" Supply Connection				
	Cast iron	2K7226 19012	242	Loctite† No. 242, 10 cc bottle (not furnished with handwheel)	1M5933 X0012
	Steel	2K7225 22012			
	1/2" Supply Connection				
	Cast iron	2K7232 19012			

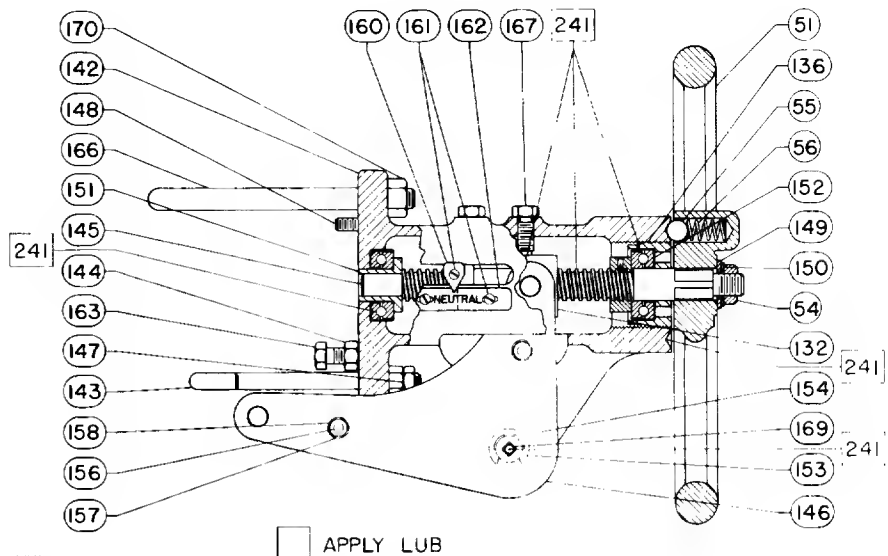
* Recommended spare part.
† Trademark of Loctite Corp.

Type 657

Key	Description	Part Number
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Side Mounted Handwheel

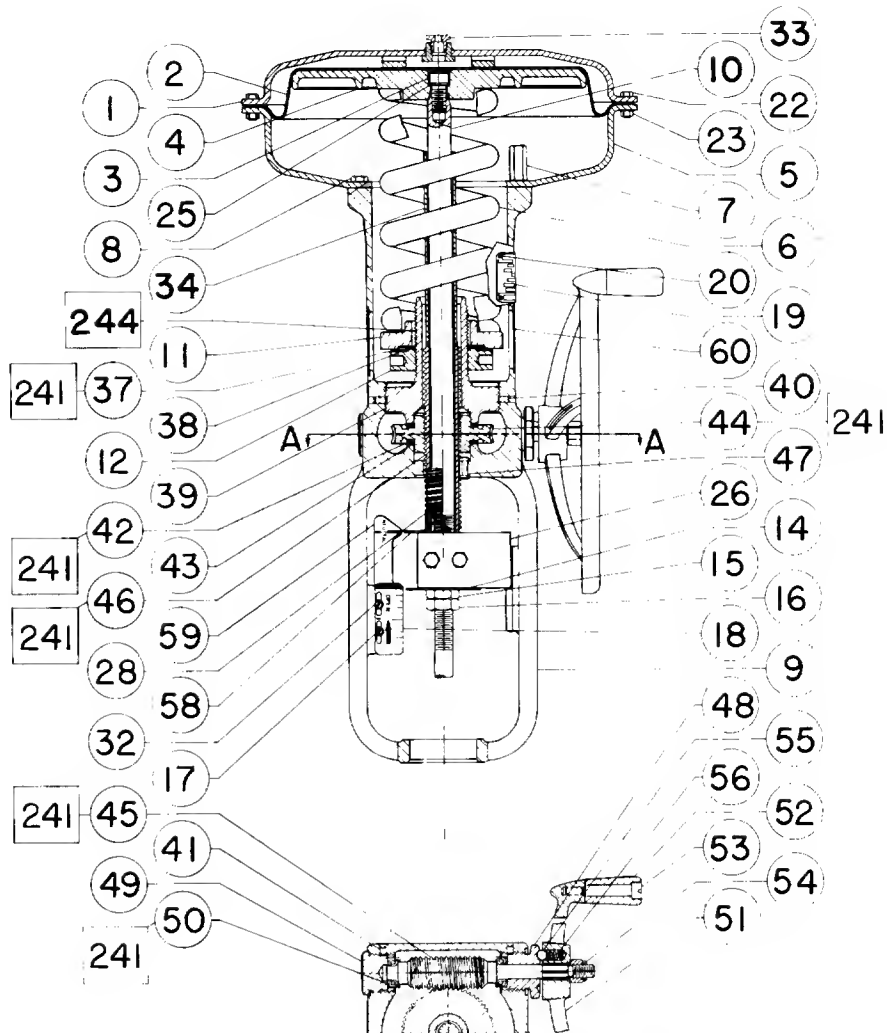
28	Machine Screw, pl steel (2 req'd) Sizes 70 & 87	1H7365 28982
34	Upper Sleeve, steel Sizes 70 & 87 7/16" (11 mm) travel 3/4" (19 mm) travel 1-1/8" (29 mm) travel 1-1/2" (38 mm) travel 2" (51 mm) travel 3" (76 mm) travel 4" (102 mm) travel	1R8164 26012 1N8877 26012 1N8876 26012 1N8875 26012 1N8874 26012 1N8873 26012 11A8263 X012 11A9913 X012
37	Needle Bearing, steel Sizes 70 & 87	1N8885 99012
38	Needle Bearing Race, steel Sizes 70 & 87 (2 req'd)	1N8886 99012
39	Bearing Retainer Flange, cast iron Size 70 & 87	1N8868 19052
40	Set Screw, steel Sizes 70 & 87 (2 req'd)	1A7122 28992
41	Set Screw, steel Sizes 70 & 87 (2 req'd)	1A7103 28992
42	Needle Bearing, steel Sizes 70 & 87 (2 req'd)	1N8887 99012
43	Needle Bearing Race, steel Sizes 70 & 87 (4 req'd)	1N8888 99012
44	Worm Gear, bronze Sizes 70 & 87	2N8862 12052
45	Worm Shaft, steel Sizes 70 & 87	2N8863 31092
46	Lower Sleeve, steel Sizes 70 & 87 7/16" (11 mm) thru 3" (76 mm) travel 4" (102 mm) travel	2N8882 24092 21A8262 X012
47	Key, steel Sizes 70 & 87	1N8880 25092
48	Front Worm Retainer, steel Sizes 70 & 87	1N8884 24092
49	Back Worm Retainer, steel Sizes 70 & 87	1N8883 24492
50	Ball Bearing, steel Sizes 70 & 87 (2 req'd)	1A3392 28992
51	Handwheel, cast iron Sizes 34 & 40 Sizes 45, 46, 50 & 60 Sizes 70 & 87	2D3585 19052 2D4050 19042 3H7343 19052
52	Handgrip, steel Sizes 70 & 87	0U0756 24092

**Figure 10. Side Mounted Handwheel Assembly for Size 34 and 40 Actuators**

Key	Description	Part Number	Key	Description	Part Number
53	Handgrip Bolt, steel Sizes 70 & 87	0U0774 24092	143	Mounting Bolts, steel Sizes 34, 40 45 & 46	10A8522 X012 1F1556 24092
54	Hex Nut, pl steel Sizes 34 & 40 Sizes 45, 46, 50 & 60 Sizes 70 & 87	1A3524 24112 1A3524 24122 1A7805 28992	144	Hex Nut, pl steel Sizes 34, 40, 50 & 60 (4 req'd) Sizes 45 & 46 (2 req'd)	1A3753 24122 1A3753 24122
55	Ball, steel	1A3427 32992	145	Handwheel Screw, bronze Left Hand (direct acting valve) Sizes 34 & 40 Sizes 45, 46, 50 & 60 Right Hand (reverse acting valve) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6584 000A2 1F5486 14052 1F6583 000A2 1F5487 14052
56	Spring, bronze	0D0059 16012	146	Lever & Pin Ass'y, steel Right Hand Side Sizes 34 & 40 Sizes 45, 46, 50 & 60 Left Hand Side Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6614 000A2 1F6613 000A2 1F1539 000A2
58	Travel Stop Indicator, SST Sizes 70 & 87	1N8872 36012	147	Hex Jam Nut, pl steel Sizes 34 & 40 (2 req'd)	1A3522 24122
59	Handwheel Indicator, SST Sizes 70 & 87 7/16" (11 mm) thru 3" (76 mm) travel 4" (102 mm) travel	1J4608 38992 10A2446 X012	148	Dowel Pin, steel Sizes 34 thru 60 (2 req'd)	1D4198 28992
60	Cover Band Ass'y, steel Sizes 70 & 87	1N8879 X00A2	149	Washer, pl steel Sizes 34 thru 60	1A5189 25012
61	Grease Fitting, pl steel Sizes 70 & 87	1A9267 28982	150	Lockwasher, pl steel Sizes 34 thru 60	1A3538 28982
132	Operating Nut, steel Left Hand (direct acting valve) Sizes 34 & 40 Sizes 45, 46, 50 & 60 Right Hand (reverse acting valve) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6590 24092 2F5485 24092 1F6589 24092 2F5484 24092	151	Bushing, steel Sizes 34 & 40	1F6579 24092
136	Bearing Retainer Sizes 34 & 40 Brass Sizes 45, 46, 50 & 60, Steel	1F6580 14012 1D3852 24092			
142	Handwheel Body, cast iron Sizes 34 & 40 Sizes 45, 46, 50 & 60	3F6572 000A2 3F1446 000A2			

Type 657

Key	Description	Part Number
152	Ball Bearing, steel Sizes 34 thru 60 (2 req'd)	1D3613 99012
153	Lever Pivot Pin, 416 SST Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6581 35232 1F1562 35232
154	Retaining Ring, pl steel (2 req'd) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F5994 28982 1A9030 28992
155	Spacer, steel (2 req'd) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6582 24092 1F1625 24092
156	Screw, pl steel (2 req'd) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1D9806 28982 1F1576 24052
157	Lockwasher, pl steel (2 req'd) Sizes 34 & 40	1C2256 28982
158	Hex Nut, pl steel Sizes 34 & 40 (2 req'd) Sizes 45, 46, 50 & 60 (4 req'd)	1A3457 24122 1A3412 24122
159	Pointer Mounting Bolt, 416 SST Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6578 35132 1F1565 35132
160	Pointer, 302 SST Sizes 34 thru 60	1F1575 36012
161	Machine Screw, pl steel Sizes 34 & 40 (3 req'd) Sizes 45, 46, 50 & 60 (1 req'd)	1A3319 28982 1E1758 28982
162	Indicator Plate, aluminum Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F9364 11992 1D3574 11992
163	Cap Screw, pl steel (2 req'd) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1C4038 24052 1A3444 24052
166	U-Bolt, steel Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6577 24092 1F1555 24092
167	Guide Bolt, 416 SST (2 req'd) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1F6575 35132 1F1552 35132



SECTION A-A

Figure 11. Type 657 Size 70 Actuator with Side Mounted Handwheel

Key	Description	Part Number	Key	Description	Part Number
168	Set Screw, steel Sizes 34 & 40 Sizes 45, 46, 50 & 60	1A3447 24182 1A3415 28992	177	Spring Cap, steel Sizes 45, 46, 50 & 60	1D3851 24052
169	Grease Fitting Sizes 34 thru 60	1H3061 99012	178	Machine Screw, pl steel (2 req'd) Sizes 45, 46, 50 & 60	1A3319 28982
170	Hex Nut, pl steel (2 req'd) Sizes 34 & 40 Sizes 45, 46, 50 & 60	1A3412 24112 1A3433 24122	241	Lubriplate MAG-1, 14 oz (0.396 kg) can (not furnished with handwheel) sizes 34 thru 60	1M1100 X0012
			244	Molykote† No. 77, 1 pint (0.473 kg) can (not furnished with handwheel) Sizes 70 & 87	1M5251 06992

†Trademark of Dow Corning Corp

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